Organic Management of Turfgrass: a Comparison of Composts in Monroe, Nassau, Tompkins, and Tioga Counties

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Abstract: The application of composts for improvement of athletic fields is being demonstrated in four areas of the state: Monroe, Nassau, Tioga, and Tompkins County. Several composted materials were applied at varied rates in the spring and fall of 2000. Turfgrass quality, soil nutrients, disease suppressiveness, nematode populations and pest occurrence are being monitored. Significant differences among treatments were not seen in the first season, but are expected within the next two years. Valuable information was gained in 2000 on application techniques.

Introduction: Across the state, stakeholders ask Cooperative Extension offices to deliver methods for organic turf maintenance. The value of active organic matter, such as composts containing beneficial microbes and plant nutrients has long been accepted in production horticulture and vegetable gardens. However, protocols must be developed for the use of composts for lawns and athletic fields. Studies at Cornell have indicated advantages in turfgrass disease suppression with specific composted materials. The main goal of this project is to demonstrate the long-term effects of topdressing lawns and athletic fields with active composts. In the process, we will compare local and regional compost products, rates, and application techniques.

Objectives:

- To evaluate the effects of topdressing with composts from varied sources in a natural organic lawn care program.
- To incorporate the NOFA guidelines and suggestions from resources such as North Country Organics and Rodale Press into a simplified format for organic IPM of turfgrass in New York conditions.
- To develop an integrated demonstration program that links research faculty from Cornell University, extension educators, and industry innovators.

Progress to date:

Four sites were selected for the demonstration: athletic fields in Monroe, Nassau, and Tioga Counties; and a lawn area in Tompkins County. Collaborations were established between the County Extension Educators, IPM staff, on-site school administrations and groundskeepers, and Ithaca-based Cornell faculty. Baseline information on soil nutrients and turfgrass quality was collected in the spring. Subsequently, all areas were topdressed with compost once in the spring and again in the fall. (*Tioga did not receive a fall application). A variety of composts and rates were tested at each site. Additional turfgrass quality assessments were made during the season. In the summer, soils from all treatments and sites were evaluated for disease suppressiveness and the presence of beneficial and harmful nematodes. In addition, the compost application was the focus of a fall demonstration and education day for turfgrass managers and groundskeepers in Monroe County.

Materials and Methods

<u>Site Assessment</u>

In the spring, soil samples from all plots at all locations were analyzed for nutrients, pH and texture. Penetrometer readings were also taken as a measure of compaction. These data will be taken annually to compare long-term changes resulting from compost applications, and to assess needs for additional nutrient applications. In addition, these sites are being used in a project that compares analyses of leaf tissue nutrients with soil nutrients. The project is being conducted by Marty Petrovic and Joann Gruttadaurio, in

the Horticulture Dept. at Cornell University, Ithaca. Results from their study will also be used to evaluate change in our plots and advise nutrient needs of the turfgrass.

Compost Applications

At each site, compost applications were assigned to large plots (≥1,000 ft^2), that were replicated and blocked by amount of traffic when possible. Materials and rates are shown in Table 1. After the spring application, a sample of each compost was sent to Woods End Research Laboratory (Mt. Vernon, ME) for analysis. The source materials and analysis results for each material are shown in Table 2.

Table 1. Compost Treatments

	Rate	
Tompkins County	**yd^3/1,000 ft^2**	**Thickness**
Ithaca College compost, green (6 wks. old)	1	3/8"
Ithaca College compost, seasoned (2 yrs. old)	1	3/8"
All Gro	1	3/8"
BionSoil	1	3/8"
Control	none	none
Tioga County		
BionSoil	1	3/8"
BionSoil	2	3/4"
Control	none	none
Nassau County		
BionSoil	0.16	1/16"
BionSoil	0.33	1/8"
BionSoil	0.67	1/4"
Control	none	none
Monroe County		
BionSoil	0.67	1/4"
BionSoil	1.33	1/2"
Planet Green	1.33	1/2"
Control	none	none

Table 2. Compost Source Materials and Analyses.

	Ithaca College				
Compost	**Immature**	**Mature**	**BionSoil**	**Planet Green**	**All Gro**
Source Materials	Food scraps, landscape wastes, wood chips	Food scraps, landscape wastes, wood chips	Dairy manure, bedding	Mushroom waste	Biosolids, yard waste
Water holding capacity (dry basis)	220	143%	114%	173%	208%
pH	6.7	6.5	7.7	6	7.5
Free carbonates (rating)	1 (none)	3 (v. high)	2 (m. high)	3 (v. high)	1 (none)
Organic Matter (dry basis)	71%	43%	33%	54%	66%
Conductivity	38 (v. high)	7 (med high)	2 (low)	24.6 (v. high)	1.9 (low)
Carbon:Nitrogen	8 (v. low)	6.4 (ext. low)	18 (med)	11.6 (m. low)	21 (medium)
Maturity index	1 (raw compost)	6 (curing)	6 (curing)	3 (active)	5 (low-active)
Total Nitrogen (dry basis)	4.8%	3.6%	0.9%	2.5%	1.7%

*Descriptors (in parentheses) determined by Woods End Laboratory

Fields were core aerified 0-7 days prior to compost applications. Composts were applied with a variety of equipment, depending on availability at each site, and the wetness, fineness and uniformity of the materials. A topdresser was used in Monroe and Tioga Counties, and a salt spreader in Nassau County. Plots in Tompkins County were smaller (50 x 20 ft), and materials were dropped by a front loader and then spread manually using shovels and rakes. Compost and cores were crushed and dragged subsequent to application at most sites.

Evaluations

Plots were evaluated for turfgrass quality 2-3 times during the growing season. Assessments included at least 4 components:

1) Cover: % turfgrass, weeds, and bare ground,
2) Color
3) Uniformity
4) Safety

Cover

Cover was determined by a point-quadrat method. A one-meter-square grid was constructed with internal cross strings forming intersections as 25 cm intervals, for a total of 16 intersection points in the grid. The grid was placed on the turf in 3-5 locations per plot, and the same grid locations were followed throughout the season. When the grid was on the turf, a reading was made at each intersection point whether the area immediately below it was a turfgrass plant, weed plant, or bare ground. These readings were converted into % cover of turf, weeds and bare for each plot and treatment.

Color, Uniformity, and Safety

Color, Uniformity, and Safety were assessed by walking through each plot and rating them on a scale of 1-9. Criteria were as follows:

Color: 1 = brown, dead 9 = deep, dark green

Uniformity: 1 = severely mixed weed and grass species and bare spots, 9 = completely uniform appearance and texture of desirable grass

Safety (footing): 1 = very lumpy and clumped, holes and other dangerous playing hazards, 9 = smooth, even, safe

Other management practices

This season, the groundskeepers at each site followed their normal cultural practices for mowing, fertility management, etc. Next year, we plan to adjust fertility inputs based on results from this project.

Disease Suppressiveness

Soil samples were taken in July from three sites and tested for suppressiveness to *Pythium* fungi. Soil samples were pulverized, mixed, seeded with bentgrass and inoculated with *Pythium* fungi. Treatments were rated for emergence of seedlings and mycelial colonization on a scale of 1 to 5, and compared to a susceptible inoculated control. These ratings were averaged, with 0 showing no suppressiveness, and 5 being highly suppressive.

Nematode Populations

Plant parasitic and free-living nematodes were extracted and identified from the soil samples taken 8/4/00 at the Tompkins County site, to determine if compost applications have an effect on their populations.

Results and Discussion

The most significant result this year was knowledge gained about application procedures. The compost materials varied greatly in their texture and moisture content, and therefore ease of application. A topdresser was our preferred method for application, but clumping of wet compost and clogging with large objects sometimes precluded the use of this equipment. We have been working with producers to supply us with material that is drier, finer and more uniform. We hope to make all applications with a topdresser in the 2001 season.

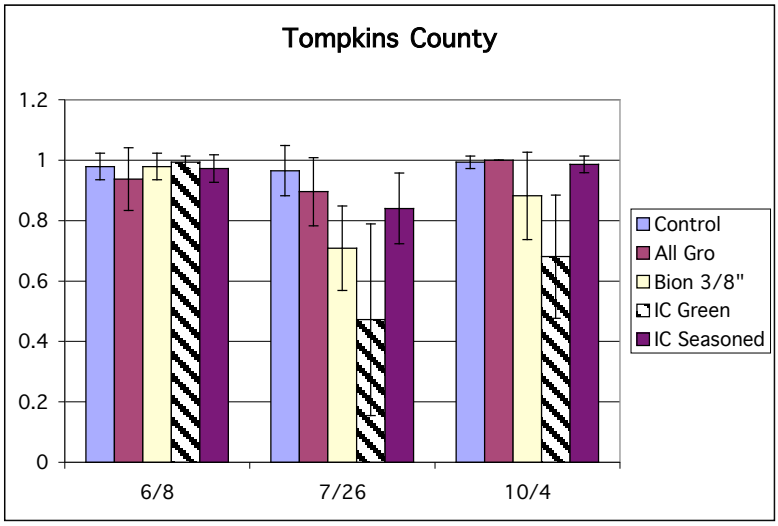
The potential for creation of compost layers in the turf profile is one of our long-term concerns in this project. Aeration prior to compost applications with crushing and dragging of cores afterwards was intended to incorporate the compost and prevent layering. At the Tompkins County site, we felt that incorporation was insufficient in most plots several weeks after the first application. Therefore, these plots were cored and dragged again, approximately one month after the initial applications, and aerification was more intensive prior to the fall application. Layering was more likely to occur at this site because compost was applied manually and therefore less uniformly, and because this field was not in use. Active play on the field could have helped to incorporate material.

Quality

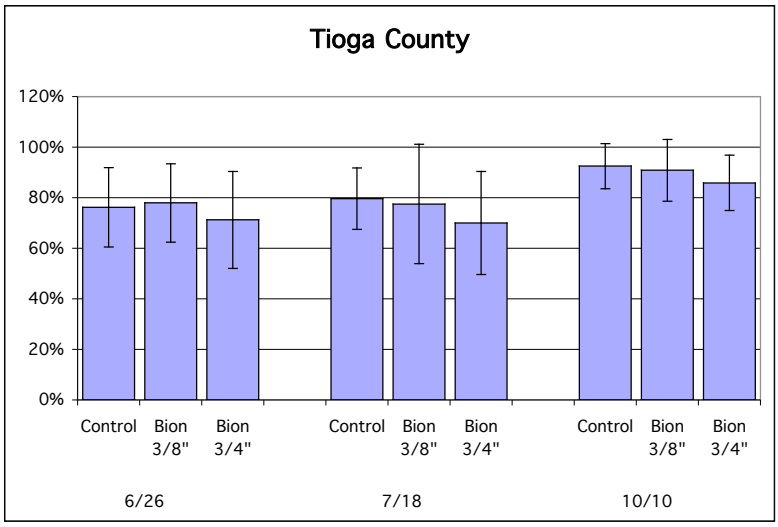
The percent turfgrass coverage for the three upstate sites is shown in Figure 1. At the Tompkins County site, turfgrass coverage in the BionSoil and IC Green treatments was low one month after application the initial application (7/26), However, these differences were not significant due to high variability among plots. The IC Green compost was not mature, and clearly burned the turf in some areas. This treatment was discontinued after the spring application. The reduced turf coverage in the Tompkins County BionSoil plots was not seen at other sites, and may have been caused by thick areas in the uneven manual application smothering the grass. These plots recovered by October. No significant differences among treatments were seen at any site, except that the Ithaca College immature compost was significantly worse than most other treatments in the fall sampling at the Tompkins County site.

There were also no significant differences or trends seen between plots when comparing color, uniformity and safety ratings among treatments at the three upstate sites. Therefore, these data are not presented. At the Nassau County site, quality was reported as better in the BionSoil 1/4" and 1/2" treatments as opposed to the control. We expect that the experiment will need to run longer term before real differences will be seen.

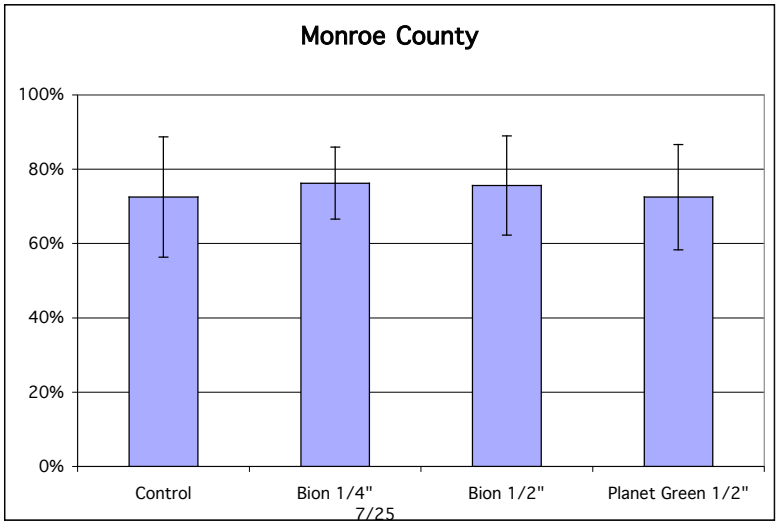
Figure 1. %Turfgrass coverage, 2000 field season.



***compost applied 6/22 & 10/25**



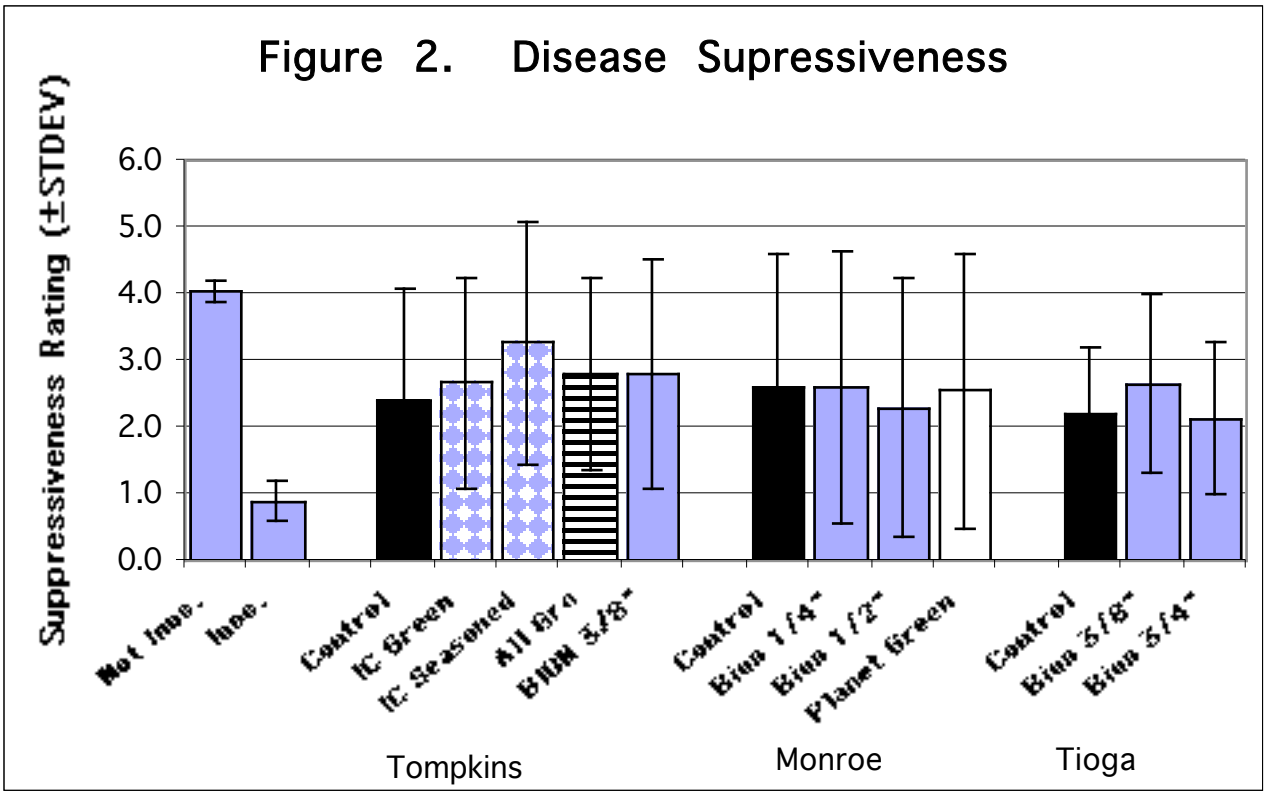
***compost applied 6/26 only**



***compost applied 6/5 and 10/17**

Disease Suppressiveness

Soil samples taken in July from three sites were tested for suppressiveness to *Pythium* fungi, and results are shown in Figure 2. *Pythium* serves as a useful indicator organism because of its high sensitivity to competing microorganisms. Four of the soils tested could be considered suppressive, because their ratings do not overlap with that of the inoculated control (2nd column). Two of these soils were at the Tompkins County site: IC Seasoned and All Gro, and two in Tioga County: BionSoil (3/8") and the control. Suppressiveness may be inherent to these soils, the composts applied, or the application of composts may favor beneficial microbes in either the soil or compost. Interpretation of these first season data should be cautious, because variability was high.



Nematode Populations

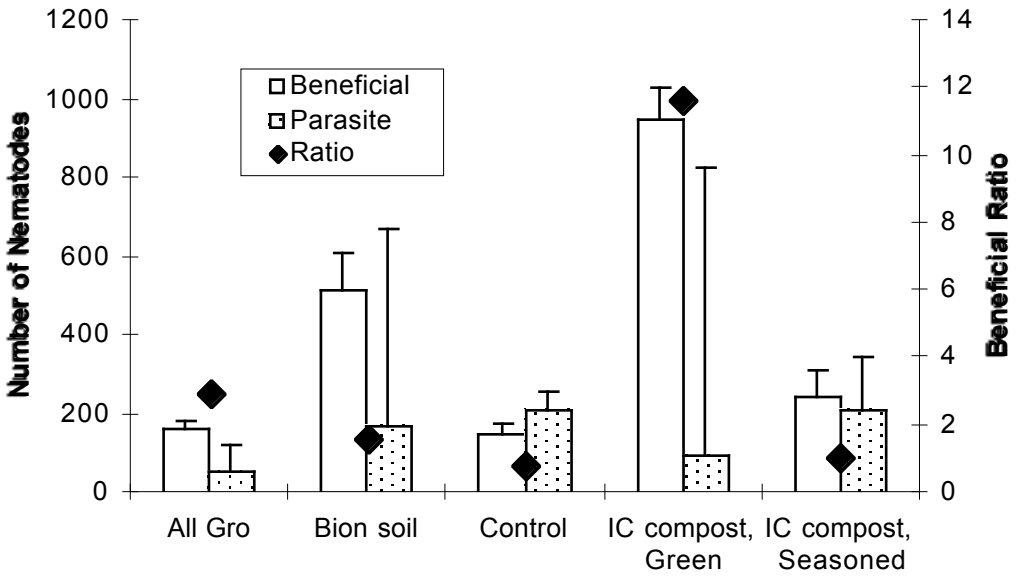
Figure 3 shows the effect of the four compost amendments on average numbers of parasitic and beneficial free-living nematodes and the beneficial ratio (beneficials:parasites). The parasitic to beneficial ratio was >1 for the control, <1 for all other treatments. Since this is one sample period, caution should be taken in interpreting the results. However, it appears that All Gro and IC Green may reduce plant parasitic nematode numbers and improve beneficial ratios more than the other treatments. If beneficial nematode numbers are taken alone, then Bion and IC green significantly increased free-living nematodes. "All Gro", however, significantly decreased parasitic nematodes.

The most abundant plant parasite and free-living beneficial nematodes by far were ring nematodes (*Criconemella* sp.) and *Cephalobus* sp. respectively. Figure 4 shows the effect of compost treatments on these two nematodes. The results are generally similar to the effect observed on all nematodes counted (in Figure 3).

CONCLUSIONS

The project was successfully initiated in 2000. As discussed, the most significant result to date has been improved information on application techniques. We expect that clear differences in turfgrass quality, based on compost materials and application rates, will become evident in the second or third year.

Figure 3. Average Number of Free-living and Plant Parasitic Nematodes and Beneficial ratio (Freeliving/Parasite) at Tompkins County Site



*bars show standard error

Figure 4. Effect of Compost Applications on *Criconemella sp* . and *Cephalobus sp* .